THE GREEN PLAN

IMPLICATIONS FOR GROUNDWATER

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THE GREEN PLAN - IMPLICATIONS FOR GROUNDWATER

Summary

1. Groundwater concerns are an important and essential component of many of the issues in the Green Plan having a more or less direct impact on the environment.

   a) One specific action item in the Green Plan deals with groundwater - the development of Guidelines for Groundwater;

Other important issues requiring significant C&P groundwater input are those relating to:

   b) The North (contaminated site cleanup and monitoring);

   c) Agriculture (including the impacts of pesticides, fertilizers, both natural and artificial, on groundwater and also questions of water supply);

   d) Climate Change (including such diverse issues as the impact of energy saving technologies such as ground-source heat pumps on the groundwater regime and the effect of possible rises in sea level on contamination of aquifers by salt water intrusion);

   e) Improved ways of dealing with Environmental Emergencies (such as land-based spills of hydrocarbons or chemicals);

   f) Use of Economic Instruments in Groundwater Management;

   g) Wetlands (groundwater recharge and contamination);

   h) SOE Reporting;

   i) Acid Rain (monitoring of anticipated improvement and research).

Besides these major issues, there are others where groundwater plays a role but is relatively less important than in the issues listed above.

2. Besides these real world issues, the Green Plan contains several "facilitating" initiatives which do not impact directly on the real world, but are intended to make the process of responding to those real world concerns more effective.

They include:

   a) Funding of Scholarships, Professorial Chairs and Strategic Grants to universities;

   b) Revitalizing government research facilities;

c) Funding technology development and commercialization programs;

d) Improving the government's socio-economic capability in environmental issues.

3. The recently released C&P Groundwater Strategy is in good accord with the groundwater issues identified in the Green Plan.

   The only groundwater issue mentioned in the Green Plan which was not considered in the Strategy relates to the conduct of environmental audits. However, there seem to be no serious difficulties in dealing with the environmental audit issue with available resources.

4. The Groundwater Strategy provides the necessary framework for developing and applying the Groundwater Guidelines called for by the Green Plan. There would be little point in developing Guidelines if there were no way of putting them into effect, and the Strategy provides the required federal/provincial and interdepartmental mechanisms.

5. This being the case, the Strategy can quite legitimately be regarded as the essential first step in responding to the Green Plan requirement to develop Groundwater Guidelines. Accordingly, departmental approval of the Strategy should be sought immediately and the Strategy could then be issued as a public statement of progress towards implementing the Green Plan Initiative on Groundwater.

6. Besides the specific Initiative relating to the development of Groundwater Guidelines, the Strategy also provides the basic rationale for all the other groundwater-related Initiatives, including the "facilitating" initiatives mentioned above.

7. The CPG document "Key Initiatives by Year" is missing several important initiatives relating to groundwater. It should be amended to incorporate these Initiatives.

8. There appears to be a serious lack of mechanisms for achieving interdepartmental coordination in undertaking the Green Plan Initiatives relating to groundwater, both from the point of view of preparing MCs and subsequently, in actually carrying out the planned activities. This deficiency could have serious consequences for C&P, if it cannot effectively provide input to other departments about issues for which the other department has the lead. Conversely, other departments are apparently unable to provide formal input to issues for which DOE has the lead.

9. This problem - lack of coordination - presumably applies to other issues besides groundwater. Developing such coordination mechanisms would therefore appear to be an urgent concern for C&P.

Introduction

This document presents an analysis of the document **"CANADA'S GREEN PLAN"** from the perspective of its implications for C&P groundwater specialists and managers.

The first part of this analysis focuses on the Green Plan document itself, and what it specifically states or indirectly implies about groundwater generally.

The second part deals with the interconnections between the Green Plan document and the recently released DOE Groundwater Strategy (and its companion Background Document).

The third part of this analysis addresses the list of initiatives issued by CPG in the fact sheet **KEY INITIATIVES BY YEAR**.

Groundwater is implicated in many more of the Green Plan issues than is apparent from a cursory review. Because everything in the environment is ultimately related to everything else, it is necessary to make judgements as to what should be included and what left out. These judgements cannot help but reflect the prejudices and preconceptions of the individual making the analysis and, although efforts have been made to keep this analysis realistic, no claim is made that this analysis is completely free from such distortions.

Part 1

GENERAL IMPLICATIONS OF THE GREEN PLAN FOR GROUNDWATER

The words "groundwater" or "underground water" are used in at least seven different places throughout the Green Plan document. In addition, a need for groundwater-related activities is strongly implied in many other places, even though the word "groundwater" is not used specifically.

In the following, paragraphs marked "**A", "**B" etc. are elements of the Green Plan which have implications for groundwater and which require action of some kind from C&P organizations with responsibilities for groundwater.

In Section One, The Overview:

Chapter I. Our Planet, Our Nation, Ourselves:

page 3, 4th para.

"Pollution in the Great Lakes and the St. Lawrence, smog in our cities, and **the contamination of groundwater** and soil show how rapidly neglect can erode the most generous environmental legacy."

Chapter II. A Partnership for Change:

Priority Objectives for Canadians

Clean Air, Water and Land, page 9, last para.

"...we now face new and more complex problems, such as the widespread **release of toxic chemicals, smog, overfloving landfill sites** and **degradation of our water** and ocean **resources.** In addition, there are growing concerns about our ability to **prevent and,** when necessary, **respond to environmental emergencies such as oil and chemical spills.**"

Groundwater plays a significant role in the areas indicated in **bold characters.**

In Section Two, The Green Plan:

Chapter I. Life's Three Essentials - Clean Air, Water and Land

Part B. Continuing Action to Protect and Restore Our Water

Maps, pps. 31 and 33:

Many of these areas of concern have a major groundwater component.

**A Drinking Water Supplies Must Be Safe and Secure, p 35:

"Action on **Groundwater**

One quarter of Canadians - one million people in the Maritime provinces alone - rely on **groundwater** as the source of their domestic water supplies. **Groundwater** is important not only for human consumption, but also for livestock watering, aquaculture and mining. However, in many parts of Canada, our **groundwater resources** are polluted by pesticides, leaking underground storage tanks and contamination from landfill waste disposal.

- The federal government will publish a series of guidelines and codes of practice to help local authorities deal with **groundwater** problems."

This is the major reference to groundwater in the Green Plan. It should be recognized that mere publication of guidelines provides no assurance that such guidelines will, in fact, be used by local authorities.

**B We Must Make Wiser Use of Our Water, p. 38, first para.:

"Despite Canada's seeming abundance of freshwater resources, our freshwater supplies are not inexhaustible. Some regions are already beginning to stretch the physical capacity of rivers, lakes and **underground water** systems to meet ever-increasing demands for water. In some areas of relative abundance, water supplies are being threatened by pollution."

Part C. **Keeping** Toxics Out of Our Environment

Introduction, p. 43, paras. 2 and 3:

"The improper production, **transportation, storage and disposal of chemicals,** however, can also pose threats to the environment and to our health. Canadians are concerned about toxic chemicals in the air we breathe, **the water we drink** and the land that supplies our food. **Chemical spills,** such as those experienced in the Mississauga, Ontario, train derailment and the St-Basile-le-Grand, Quebec, PCB warehouse fire, have brought the dangers posed by toxic chemicals very close to home for thousands of Canadians.

Throughout the Green Plan consultations, Canadians strongly supported the need to increase controls over toxic chemicals. In addition, they want those toxic chemicals already present in the environment removed and toxic dump sites cleaned up and restored."

Groundwater is an important consideration in those areas indicated in bold type.

Actions To Date Are Having a Positive Effect, p.44, 3rd para.:

Groundwater is one of, if not the most important consideration in the clean-up of contaminated sites.

Part E. Cutting Wastes in Half

**C Cleaning up Contaminated Sites, p. 60:

See previous comment.

Chapter II. Sustaining Our Renewable Resources

Part B. Achieving Environmental Sustainability in Agriculture

**D Providing a Clean Water Supply, p. 70:

"A stable supply of high-quality water is essential for agricultural production. At the same time, agricultural activities can contribute to both surface and groundwater quality problems. Improper manure management can pollute lakes and streams; fertilizers and pesticides can contaminate groundwater. In areas susceptible to drought, more stable water supplies and improved irrigation can help conserve water and provide opportunities for both agriculture and other water users.

- In cooperation with the provinces, the Government will pursue initiatives that include water quality research and enhancement to reduce pollution of water resources by pesticides, nutrients from fertilizers and manure, and other wastes. ....."

Chapter III. Our Special Spaces and Species.

Part A. Protecting Our Unique Ecological Areas

**B Conserving Canada's Wetlands, p. 82:

".... **wetlands** are an integral part of our freshwater systems, providing a range of benefits to Canadians, including natural flood control, water cleansing, and **groundwater recharge.**"

It should also be noted that wetlands in groundwater discharge areas can be severely impacted by groundwater contaminated by, e.g., agricultural chemicals.

Chapter IV. Canada's Unique Stewardship: The Arctic.

Part A. Preserving the Integrity of our Northland

Introduction, p. 91:

"The Arctic environment is showing disturbing evidence of toxic contaminants, including PCBs, dioxins, pesticides and heavy metals.
.....

.... There are over **800 sites across the North containing hazardous or abandoned materials** that are potentially dangerous to man, wildlife and the environment."

Dealing with these sites effectively will require major groundwater input. A common misconception is that permafrost areas are essentially impermeable to groundwater movement. This is known to be incorrect.

The Arctic Environmental Strategy, p. 92, para. 3:

"The major elements of the Strategy .....include **dealing with Artic contaminants, managing vaste in the North, improving northern vater quality, expanding research and information activities,....**"

A significant groundwater component will be required for all the activities indicated in **boldface type.**

**F Contaminants, p. 93:

"Specific actions will include research on the sources, sinks, pathways and trends of contaminants,....."

This will have to include research on the subsurface movement of contaminants and their interactions with the groundwater/permafrost system. (Although the current conventional wisdom is that persistent contaminants reach Northern ecosystems primarily by long range transport, it would be prudent to investigate the possible contribution of local sources, e.g. dump-sites, before negotiating any Treaties with circumpolar nations.)

**G Waste Clean-up and Management, p. 94:

"Hazardous and non-hazardous wastes have accumulated at over 800 sites across the Arctic, and they pose a threat to health and the environment. To correct this situation, the federal government will :

- clean up all known hazardous wastes on Crown lands in the North;

- clean up all hazardous wastes at abandoned military sites;

- clean up all abandoned DEW Line sites across the North; and

- begin clean up of non- hazardous wastes near communities.

....."

As in the southern parts of Canada, groundwater will be an essential and major element of these clean up operations.

**H Water Quality and Quantity, p. 94:

"The federal government will increase its capability to monitor and evaluate water quality in order to maintain the quality of water resources, and thereby to meet our commitments for the protection of northern aquatic ecosystems. The Government, in co-operation with the territorial governments, will undertake the following measures :

- It will develop and implement a comprehensive and systematic network of water quality stations throughout the North to provide baseline information ..... This program is also critical for understanding the sources of contaminants to be found in northern ecosystems. In addition, specific monitoring programs will be established to determine how water use and developments affect specific areas.

- It will expand and modernize the network of water quantity monitoring stations in all major water basins. .....

- It will provide increased analytical and interpretation capabilities to support these programs."

Groundwater is a significant element of all these activities, especially the water quality/contamination programs, and especially in the Yukon, where groundwater is used extensively.

Chapter V. Global Environmental Security

Part A. Global Warming: Action at Home and Abroad

Global Warming and Cold Canada, p. 99, second para.:

"For example, **a one-metre rise in sea levels** would affect more than 250 buildings in Charlottetown, Prince Edward Island, and **would contaminate vital local groundwater supplies** with sea water."

Figure, Impacts of Global Warming on Canada, p. 99:

Many of these impacts have an important groundwater component, either direct, e.g. thawing of permafrost, or indirect, e.g. increased reliance on groundwater supplies in areas becoming more susceptible to drought.

The 'Advanced House' - A Home To Warm Up To, p. 101:

"It .... uses just one piece of equipment to replace the furnace, hot water tank, air-conditioner and ventilation system."

This piece of equipment is called a "ground-source heat pump", and it relies on the aquifer/groundwater system for its highly efficient operation.

**I Strategy No. 1: Limiting Net Emissions, p. 103 ff.:

Groundwater plays a major role in many technologies for improving energy efficiency, e.g. the ground-source heat pumps mentioned above; the many installations using groundwater for commercial and industrial cooling and conventional geothermal energy systems, both low temperature (e.g. Charlottetown; Carleton University, Ottawa; University of Regina) and high temperature (British Columbia). The use of groundwater/aquifer systems for enhancing energy efficiency is likely to increase significantly.

All these technologies have the potential to cause extensive damage to aquifers, unless properly installed and operated by owners and managed effectively by water management agencies.

**J Strategy No. 2: Anticipating and Preparing for Global Warming p. 109-110:

"The Government of Canada will identify those areas that are at risk and will provide Canadians with a wide range of new information on effects and mitigation. Federal government efforts will include:

- by 1994, adopting guidelines to ensure that the potential changes in the Canadian environment as a result of climate change are considered in major projects;

- by 1996, assessing the socio-economic repercussions of climate change on the Great Lakes and St. Lawrence River Basin, the Prairies and the MacKenzie Basin; and

- by 1996, assessing policy changes that might be needed to deal with rising sea levels along both the east and west coasts of Canada."

Groundwater concerns will be important components of all three of these activities.

Part C. Acid Rain: Building on Success

Introduction, p. 119, first para.:

"When the environment cannot neutralize the acid being deposited, damage occurs."

The component of the environment that does most of the "neutralizing" is the groundwater/aquifer system. This is widely recognized internationally but, apparently, not yet in Canada.

**K Verifying Progress, p. 122:

"Environmental conditions must be monitored to verify the effectiveness of the Canadian and U.S. acid rain control measures, particularly those relating to human health and forestry.

The federal government will continue its acid rain research and monitoring efforts to verify the adequacy of both Canadian and American acid rain control programs. These will include:

- determining the rate and extent of lake and river recovery from acid rain damage;

- .....

- ..... "

These research and monitoring activities will have to include a very significant groundwater component if they are to succeed in making an accurate and complete assessment of the hoped-for recovery.

Chapter VI. Environmentally Responsible Decision-Making.

Part B. Environmental Information: The Key to Sound Decision-Making

**L State of the Environment Reporting, p. 141:

" - By 1993, Canada will establish a long-term State of the Environment monitoring and assessment capability to study resources at risk, ecosystem response and the impact of major disruptions to ecosystems."

Groundwater is an essential component of this capability. The omission of groundwater from the first SOE Report was a major deficiency in what was, otherwise, a reasonably balanced report.

Part D. Supporting New Science

Introduction, p. 147, third para.

" Natural scientific disciplines such as biology, chemistry and geology help us understand the individual elements that make up ecosystems and the processes that link them. The social sciences and humanities provide the understanding necessary to make long-term changes in human behaviour; this understanding is the key to moving from "react-and-cure" to an "anticipate-and-prevent" approach."

This dual natural/social science approach must be an essential ingredient of DOE's groundwater activities. The present imbalance between the natural and social sciences was noted in the Groundwater Strategy.

Promoting New Directions in Environmental Science

**M Training Canada's Future Environmental Scientists, pps. 149-150

"The demand for highly trained environmental researchers and technologists continues to grow. To help meet Canada's future requirements for environmental scientists and foster academic excellence in environmental policy:

- The Government will fund scholarships, professorial chairs and strategic university grants in the environmental sciences. This program will focus on research activities with an ecosystem perspective. By late 1991, the first round of university chairs will be established; by mid-1992, a full slate of scholarships and strategic grants will be put in place. The program will be managed by the three granting councils - the Natural Sciences and Engineering Research Council (NSERC), the Medical Research Council (MRC), and the Social Sciences and Humanities Research Council (SSHRC)."

As emphasized in the Groundwater Strategy, the demand for trained groundwater specialists, both scientific and technical, is already critical. Action is urgently needed to ensure that Canada's current critical shortage of groundwater expertise does not get even worse.

**N Supporting Sound Policy and Regulation, p. 150

" - To meet these demands (for scientific information and advice), the federal government will revitalize its research facilities and equipment and augment its scientific staff over the next five years."

This is particularly urgent for groundwater facilities, equipment and staff which are all inadequate to meet current, let alone future needs for groundwater information and advice.

**O Technology for Solutions, pps. 150-151

"The federal government will provide cost-shared funding for programs to help encourage the development, demonstration, commercialization and dissemination of environmentally favourable technologies.

- During 1991, the Government of Canada will augment its Technology Development Program to provide technology transfer services to firms.

- To facilitate technology transfer activities in government laboratories, the Government will establish a federal-provincial Environmental Technology Network.

- ..... "

Much groundwater technology has been and continues to be developed in Canada, which stands to benefit enormously, both nationally and internationally from these programs.

Part E. Legislative, Regulatory and Market Tools for Change

An Effective Legislative Framework, p. 153:

As pointed out in the Groundwater Strategy, the effective implementation of CEPA and other legislation such as the new Canadian Environmental Assessment Act (p. 161) will require significantly increased levels of groundwater expertise within DOE and other departments.

**P Utilizing Economic Incentives, pps. 156-158:

" - In 1991, the Government of Canada will establish a program to support practical research into the use of economic instruments to address Canada's major environmental problems. The program will consist of:

- independent academic research on how economic instruments might be applied in the Canadian context;

- contributions to the study programs of independent research and policy institutes, which can provide consulting expertise to the federal government in this area."

Economic instruments will (and are already starting to) play an increasingly important role in groundwater policy and management activities.

Chapter VII. Starting in Our Own House

Part A. Federal Environmental Stewardship

**Q Environmental Audits, p. 164:

"Environmental audits can focus upon waste disposal, fuel and chemical storage, **groundwater conditions**, air and water quality, emergency preparedness and spill control, and energy use and efficiency. ...."

This is the one area of the Green Plan where groundwater is mentioned specifically, which was not addressed in the Groundwater Strategy.

Chapter VIII. Emergency Preparedness

Part A. Environmental Emergencies

Introduction, p. 165, second para.:

In many accidents occurring on land, such as the Hagersville tire fire, or spills of toxic contaminants, groundwater is one of the environmental components most threatened.

**R Pollution Emergencies, Non-Marine Spills, p. 169:

"To deal more effectively with oil and chemical spills on land or in inland waters ..... , the Government will launch a major program to improve national cooperative spill response and prevention capabilities.

- Working with industry and local and provincial governments, **the federal government will promote measures to prevent and respond to spills.** These will include .....

- **The federal government will act to ensure that it is well prepared to handle spills** and other environmental emergencies **across Canada through better contingency planning, improved environmental sensitivity mapping,** upgraded training and routine testing of emergency preparedness. **By the end of 1993, more, better equipped and better trained response crews will be in place throughout Canada.** .....

- **In co-operation with the private sector and universities, the Government will increase research into and knowledge of the properties, behaviour and repercussions of oil and chemical spills, and will promote the development of new technologies in spill detection, monitoring and clean-up. The Government will also introduce guidelines for spill-treating agents by the end of 1994."**

There is a strong groundwater component in all of the activities and concerns indicated in **bold characters**. Due to the current critical shortage of hydrogeological experts in Canada, which is likely to continue for at least the next 5 years, achievement of the 1993 and 1994 targets for the groundwater aspects of these activities will likely require considerable effort. It cannot be overemphasized that dealing with any spill event on land must involve an immediate evaluation of its impacts on groundwater.

Conclusion

Second para. p173

Significant groundwater concerns exist under each one of the seven headings listed.

Many of these concerns are new and will require an augmented level of effort.

Besides DOE, several other Departments have major groundwater concerns and roles to play in addressing these concerns.

Part 2

THE GREEN PLAN AND THE DOE GROUNDWATER STRATEGY

The Groundwater Strategy and its companion Background Document were recently released by C&P. These documents are intended to serve as statements of DOE, and eventually, federal strategy, but, as yet have not received formal approval at the Departmental or Interdepartmental levels.

Nevertheless, the Strategy has received wide support, both inside and outside DOE, as a statement of a rational approach to the groundwater issue applicable to all jurisdictions in Canada.

In order to carry out an adequate assessment of how specific elements of the Strategy relate to the Green Plan, it is necessary to compare the latter with the 24 Recommendations in the Background Document, (on which the six Major Recommendations in the Strategy are based). These connections are shown in Table I. The 24 Recommendations in the Background Document are listed in APPENDIX I for convenient reference.

Referring to Table I, it can be seen that, with the exception of Environmental Audits (Green Plan Element Q), the Groundwater Strategy addresses all groundwater related issues in the Green Plan adequately and most of them in several different Recommendations.

Similarly, with the exception of Strategies #1 to #4, which primarily deal with bureaucratic administrative arrangements, all the Strategies set out in the DOE Groundwater Strategy are connected to at least one, and usually several groundwater-related elements of the Green Plan.

Overall, then, the Strategy conforms well with what is stated specifically, or implied indirectly, about groundwater in the Green Plan.

Of the two exceptions noted above, the lack of mention of the environmental audit activity in the Groundwater Strategy should not prove too difficult to remedy. Precisely what is required has yet to be determined, but, at present at least, it does not appear to be an activity which requires a lot of PYs or dollars.

The lack of consideration of administrative matters in the Green Plan, (a document intended for public consumption), is neither surprising nor necessarily a matter for concern. It would not be expected that such questions would be dealt with in such a document. However, this does not mean that they are unimportant (for example, from the point of view of implementing the Green Plan within Departments).

Unfortunately, at least at present, there appears to be a real lack of interdepartmental coordination in implementing the Green Plan. To date, it has proved impossible to identify any committee or working group, or even

any recognized procedure within C&P, which will ensure that C&P's legitimate groundwater interests will be considered in the development of MCs or other documents by other departments. Similarly, it appears that any input by other federal government departments to the development of guidelines under the DOE Green Plan groundwater activity will be essentially whatever C&P wants it to be.

The Groundwater Strategy calls for interdepartmental consultation in developing many of the groundwater Guidelines, e.g. those relating to pesticide contamination of groundwater and ground-source heat pumps. Whereas it would be feasible for C&P to act on its own and approach other departments to seek their input to guideline development, if everyone is approaching the issue of coordination in a similar way, the situation has the potential for degenerating rapidly into chaos.

Perhaps there are mechanisms in place for ensuring interdepartmental coordination which have not been widely advertised. If this is the case, it is strongly recommended that such mechanisms be widely publicized among everyone who has a potential contribution to make to any section of the Green Plan. Otherwise, there would appear to be a serious risk that legitimate IWD, C&P, DOE and OGD concerns will be overlooked in the process of developing individual responses to the Green Plan.

Table I

GROUNDWATER - RELATED GREEN PLAN ELEMENTS REQUIRING C&P ACTION

GSR #	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1																		
2																		
3																		
4																		
5	X	X		X	X													
6	X	X		X	X											X		X
7		X					X						X					X
8		X					X					X						
9	X		X				X		X	X								X
10	X		X				X		X	X								X
11						X	X							X	X			X
12				X	X													
13		X	X	X						X						X		
14		X	X	X						X						X		
15		X	X	X						X						X		
16							X		X						X			
17				X	X	X			X		X			X				
18				X	X	X			X		X			X				
19				X									X	X				
20				X	X	X			X		X		X					
21								X			X	X						
22								X			X	X						
23										X			X					
24										X		X						

(GSR - Groundwater Strategy Background Document Recommendation)

Part 3

C&P GROUNDWATER INPUT TO KEY INITIATIVES BY YEAR

The CPG Fact Sheet "KEY INITIATIVES BY YEAR" contains 84 items, of which 21 (25 per cent) will require action by or input from one or more C&P organization(s) with groundwater expertise, as follows:

Year	Initiative	Possible C&P Roles
1991	Health and Environment Action Plan	Strategy/Program Advice
	Drinking Water Safety Act	Guidelines, Strategy/Program Advice
	Arctic Environmental Strategy	R&D on Contaminants
		Cleanup of Contaminated Sites
		Water Quantity/Quality Monitoring
	Discussion Paper on Use of Economic Instruments	Contribution on Use of Econ. Instrs. in G.W. Mgmt.
	Second National SOE Report	Groundwater Contribution
	Preliminary Set of Env. Indicators; Stakeholder Discns.	Devel. of G.W. Indicators
	1st. Round, University Chairs	Discussions, Negotiations with Interested Universities
	Envtl. Tech. Transfer to Industry	Discussions, Negotiations with Industry, Demonstrations
	Envtl. Tech. Commerclzn.	Advice, Review of Proposals
	Introduce Env. Tech. Innovn. Program	Advice, Review of Proposals

	Research into Econ. Instrs. and Environment	In-house, External Soc./Ec. Research on Groundwater
	Review of Envtl. Implicns. of Fedl. Statutes, Reglns.	Advice on Technical Implicns. of Existing Statutes, etc.
	Adopt Code of Env. Stewardship for Fedl. Ops.	Technical Advice, Particpn. in Environmental Audits
1992	Establish Scholarships, Strat. Grants at Universities	Discussions, Negotiations with Interested Universities
	Establish Long-term SOE Monitoring & Assest. Capblty.	G.W. Monitoring, Assessment
	Develop/Release Set of Envtl. Indicators	Development of G.W. Indicators
1993	Establish Better Equipped/ Trained Emerg. Resp. Crews	Setting Up Training Courses, Particpn. in Emergencies
	Establish Art. Intell. Expert Syst. for Spill Response	Devel. G.W. Part of System, Train Users
	Est. Guidelines for Oil and Chem. Spill Treating Agents	Expert Advice on G.W. Aspects, Devel. of some Guidelines
	Cleanup of 30 High-Risk Contaminated Sites	Guideline Devel., Cleanup Specs., Fed./Prov Negotns., Advice to OGDs
	Regulns./Guidelines for Hazardous Waste Streams	Guideline Devel. for GW Aspects

In addition to those Key Initiatives identified by CPG, twelve more "Initiatives" relating to groundwater fall out of the Green Plan. These are:

Year	Initiative	Possible C&P Action
1991	Action on Groundwater/ Devel. of G.W. Guidelines	Fed./Prov./Interdeptl. Guideline Devel., Implementn. of DOE G.W. Strategy
	National Conference on Water Use	Presentn. of Papers on G.W. Use, Value, etc.
	Agreements with Provinces on Contam. Sites Cleanup	Fed/Prov. Negotns., Tech. Advice, Tech. Devel., R&D.
	R&D on Impact of Agric. on Clean Water Supplies	Co-op. R&D on Impacts of Pesticides & other Ag. Chems. on Groundwater
	Federal Policy on Wetlands Adopted	Contribn. to G.W. Recharge & Contam. Aspects of Wetlands Policy
	Implement Reformed Env. Asst. Process	Provision of G.W. Advice & Expertise to Panels, Boards
	Energy Conservation in Bldgs. Updated	Advice, Guidelines on Use of Ground-Source Heat Pumps
	Monitoring of Recovery from Acid Rain	G.W. Monitoring
1992	Implement Environmental Audit Policies & Procedures	Unknown. Groundwater was specifically mentioned in Green Plan
1994	Guidelines on Climate Change Impacts in Various Regions	Analysis and assessment of Natl. Impacts (G.W. aspects)
1996	Assesst. of Soc./Ec. Aspects of Clim. Change	Anal. & Assesst. of G.W. Aspects
	Devel of Policy Changes Reqd. to Deal with Sea-Level Rise	Groundvater R&D, Assessment of G.W. Implicns., e.g., Salt Water Intrusion

Conclusions

1. Groundwater concerns are an important and essential component of many of the issues in the Green Plan having a more or less direct impact on the environment.

    a) One specific action item in the Green Plan deals with groundwater - the development of Guidelines for Groundwater;

Other important issues requiring significant C&P groundwater input are those relating to:

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Besides these major issues, there are others where groundwater plays a role but is relatively less important than in the issues listed above.

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   The only groundwater issue mentioned in the Green Plan which was not considered in the Strategy relates to the conduct of environmental audits. However, there seem to be no serious difficulties in dealing with the environmental audit issue with available resources.

4. The Groundwater Strategy provides the necessary framework for developing and applying the Groundwater Guidelines called for by the Green Plan. There would be little point in developing Guidelines if there were no way of putting them into effect, and the Strategy provides the required federal/provincial and interdepartmental mechanisms.

5. This being the case, the Strategy can quite legitimately be regarded as the essential first step in responding to the Green Plan requirement to develop Groundwater Guidelines. Accordingly, departmental approval of the Strategy should be sought immediately and the Strategy could then be issued as a public statement of progress towards implementing the Green Plan Initiative on Groundwater.

6. Besides the specific Initiative relating to the development of Groundwater Guidelines, the Strategy also provides the basic rationale for all the other groundwater-related Initiatives, including the "facilitating" initiatives mentioned above.

7. The CPG document "Key Initiatives by Year" is missing several important initiatives relating to groundwater. It should be amended to incorporate these Initiatives.

8. There appears to be a serious lack of mechanisms for achieving interdepartmental coordination in undertaking the Green Plan Initiatives relating to groundwater, both from the point of view of preparing MCs and subsequently, in actually carrying out the planned activities. This deficiency could have serious consequences for C&P, if it cannot effectively provide input to other departments about issues for which the other department has the lead. Conversely, other departments are apparently unable to provide formal input to issues for which DOE has the lead.

9. This problem - lack of coordination - presumably applies to other issues besides groundwater. Developing such coordination mechanisms would therefore appear to be an urgent concern for C&P.

Appendix I

THE 24 BACKGROUND DOCUMENT RECOMMENDATIONS

1. It is recommended that the goal of the federal government's groundwater strategy should be to assist the provinces in establishing effective, viable groundwater management systems, with the aim of having them in place in five years. After this time the federal government would decrease its involvement in and expenditures on groundwater to that level required to take care of purely federal groundwater concerns (maintenance level).

2. It is recommended that the systems and mechanisms identified in Recommendation 1. should contain, as a fundamental characteristic, procedures and systems for resolving competition for groundwater resources from all perspectives (social, economic and environmental), and for protecting and remediating groundwater sources.

3. DOE should establish a Working Group on groundwater to co-ordinate all DOE's groundwater activities. The Working Group should have a full time Chairperson and this individual should be allocated a budget to be applied to the work of other DOE groups active in groundwater. The Chairperson would be the primary contact point for groundwater matters falling under the auspices of ICW or CCME.

4. It is recommended that the Chairperson of the DOE Working Group should establish and maintain co-ordinating mechanisms with the provinces, such as working groups. Such groups should be permanent and meet regularly.

5. It is recommended that DOE through the Canada Water Act or some similar mechanism, offer to share with the provinces the costs of developing guidelines, data banks, and other groundwater management tools, provided that Provinces agree to develop and put in place effective groundwater management plans.

6. It is recommended that DOE in co-operation with other federal agencies develop groundwater management plans for areas of federal jurisdiction and responsibility.

7. It is recommended that DOE and other federal departments review their allocations of resources to groundwater activities and make appropriate re-allocations or provide for training where this appears to be necessary.

8. It is recommended that major new resources should be allocated to operational groundwater activities.

9. It is recommended that DOE approach other federal departments and the provinces with a proposal to jointly develop National Guidelines and Strategies relating to groundwater and activities which impact on groundwater. Funding of the development of specific Guidelines would generally be cost-shared according to some appropriate formula, but in

cases of particular federal importance DOE would provide 100 per cent funding.

10. It is recommended that DOE allocate a person-year immediately to hire a hydrogeologist to develop National Groundwater Guidelines and Strategies.

11. DOE should maintain its past excellent record in groundwater clean-up and prevention technology while striving for a more interdisciplinary approach and using the strategies and guidelines, when developed, to guide its programs.

12. It is recommended that the duties of the hydrogeologist to be hired by DOE (see Recommendation 10) should include responsibility for groundwater development technology. He/she should be provided with a modest budget for this work.

13. It is recommended that DOE initiate immediately a study on a national scale to establish the social, economic and environmental value of groundwater to Canadians. This should be followed up by cost-shared provincial, regional and local assessments at a more detailed scale.

14. It is recommended that, in conjunction with the actions in Recommendation 13., studies of the indirect social, economic and environmental costs of groundwater contamination should be undertaken in co-operation with the provinces and other federal departments.

15. Immediately after the study on the value of groundwater in Element 11 DOE should initiate a national overview of future demands for groundwater which should be followed up by joint, cost shared, federal-provincial studies at the regional, provincial and local levels of detail.

16. It is recommended that the overall adequacy of DOE's capability to undertake operational groundwater work including environmental assessments be reviewed, together with a review of the adequacy of existing technology transfer mechanisms between research and operational components of the Department. This review should be completed in one year.

17. It is recommended that 25 PYs and $1.25 million new resources be allocated to RD and D activities in DOE.

18. It is recommended that DOE should approach Agriculture Canada and Energy, Mines and Resources at a senior official level with a view to entering into formal agreements for joint research on groundwater topics of mutual interest. Similar agreements should be negotiated with other departments.

19. It is recommended that DOE should endorse the concept of establishing an Industrial Chair in Groundwater at a Canadian university and/or a viable groundwater program at one university in each of DOE's five Regions. DOE should assist in the establishment of these positions to some suitable level ($200,000 per year suggested). DOE should assist candidate Universities in seeking industrial sponsors.

20. It is recommended that DOE establish a fund for the support of extra-mural groundwater research, similar to the former WRRSP.

21. It is recommended that DOE establish cost shared agreements with the provinces to develop nationally compatible, efficient groundwater data banks, conditional on the provinces establishing rational groundwater management strategies.

22. It is recommended that DOE establish a working group to review its present policies concerning the collection of groundwater data and report on its findings in one year.

23. It is recommended that DOE review the adequacy of its own internal expertise and knowledge in the area of the socio-economic aspects of groundwater resources and also the extent to which any deficiencies identified could be remedied through arrangements with universities and the private sector.

24. It is recommended that DOE in its ongoing public water information programs should place more emphasis on groundwater because of its "visibility" problem compared with other water resources issues.